Command Decisionmaking in the Information Age: Is the Intuitive Thinker Doomed to Extinction?

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## EXECUTIVE SUMMARY

**Title:** Command Decisionmaking in the Information Age: Is the Intuitive Thinker Doomed to Extinction?

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**Thesis:** Despite recent advances in computer information systems, superior military decisions still require developed intuitive skills.

**Discussion:** Many believe that advanced new computer systems will allow for more effective decisionmaking. Others fear that the over-reliance on computers will slowly erode commanders' intuitive skills. However, one must understand the mechanics of how the mind makes decisions to appreciate that, regardless of computers, intuition is not a decision tool of the past.

The human brain performs two distinct intellectual processes. The left hemisphere, which processes information sequentially, is typically regarded as analytical in nature and is useful for sorting and assimilating a series of individual facts. The right hemisphere functions diffusely, and is considered more judgmental as it performs spatial comparisons of objects and ideas. Because the analytical process forms the foundation of language, mathematics, and rational thinking, it is preferred by most people. However, because of the seemingly spontaneous nature of the left hemisphere's thoughts (intuition), they are often considered less logical, and therefore less valid. Some psychologists theorized that a trained intuition was necessary to overcome the excessive preference for rational thinking, and to exploit the benefits of intuitive thought. Intuition not only allows decisions to be made faster, especially when information is lacking, but it also is key for recognizing unfamiliar patterns and ideas based on previous experiences.

Understanding some of the internal and external factors which influence decisionmaking, allows commanders who rely on intuitive methods to minimize their impact. Essentially, most military decisionmakers face two diametrically-opposed problems: insufficient information, and a necessity to accelerate their decision speed. Regardless of the era or type of warfare being waged, the military commander has always faced the problem of insufficient information, which slows down decision time. However, even with the aid of computer-based decision support systems, the final conclusions are reached within the human mind; therefore, understanding the human decision process is imperative.

**Conclusions:** Fears that decisionmakers' intuitive skills may erode are warranted. This is not due to superior performance offered by computer-aided decision systems, but rather the misconception that computers can substitute for human judgment. Affinity for analytical systems in an increasingly digital world is exacerbated by the ignorance of the human decision process. In reality, enhancing and relying on human intuitive abilities allows even greater exploitation of information from the digital

battlefield. However, until an effort is made to understand that a trained intuition will allow faster decisionmaking, the natural tendency to rely on analytical systems will continue.

Despite how computers might help us see the battlefield, fully (and rapidly) understanding the situations that face us are still very much human processes. With proper education and training, we might come to recognize those mysterious, intuitive insights as the key to our decisions.

An interesting parallel was recently drawn between two great twentieth-century commanders: General Dwight D. Eisenhower and General H. Norman Schwarzkopf. The comparison focused on the monumental decisions both men faced in deciding when to launch major military campaigns.[1] Both struggled with whether sufficient preparations had been made to ensure victory. In making their decisions, both relied heavily on information provided by support staffs and intelligence reports.[2] The advancements of technology allowed Gen. Schwarzkopf to use more sophisticated equipment to assess his situation, yet an interesting phenomenon is often overlooked—his final decision came not from a computer, but rather his personal "feeling" that the time was right. This is significant because despite passage of half a century and access to a myriad of computers, Gen. Schwarzkopf made his decision with the same tool that Gen. Eisenhower used—intuition.

## *I. THE PROBLEM AND ITS SETTING*

To many, implying that instinctual inclinations (also known as intuition) are as useful to today's decisionmaker as they were before the advent of computers may seem illogical. Some believe the ubiquity of data-crunching information systems will have a "corrosive effect on [a] commander's basic traits such as … a cultivated sense of intuition," and thus contend that "systematic decisionmaking is eclipsing intuition."[3] Obviously, there are more than sufficient examples of computer systems invading everyday life to lead one to this conclusion. The seemingly natural corollary is that, because volumes of information can be readily gathered and presented, decisions are better (and are more accurate) the greater the amount of information processed. This line of reasoning suggests that future decisionmaking

abilities will be best served by honed analytical skills, which allow the decisionmaker to process reams of computer-generated information.

## *The Problem and Solution*

The Information Age, characterized by increased capabilities to gather and disseminate data and information, has placed an increased emphasis on "analytical" skills for problem solving and decisionmaking. The deluge of data available from computers greatly increases the information that must be reviewed, or at least filtered, by decisionmakers. This leads many to believe that more powerful analytical systems capable of processing avalanches of data will result in more effective decisionmaking. Concurrently, the role of intuitive feelings in decisionmaking is seen as diminishing. Relying on "hunches" is quite often considered an anachronism in today's digital world. Does this suggest that intuitive and analytical methods of problem solving are distinct, exclusive processes?

To be a truly effective decisionmaker in today's computerized decision environment, one must understand the interaction between analytical and intuitive thinking, and the primary role intuition plays in all decisions. This is particularly important for military commanders, whose decisions are usually made under conditions of uncertainty and time constraints. Honed intuitive skills allow faster comprehension of unfamiliar situations, thus enabling the decisionmaker to act more rapidly than his opponent—a critical advantage in warfighting. Contrary as it may seem, superior decisionmaking in the Information Age still rests on the tuned intuitive skills of commanders.

## *The Necessity of this Study*

Although few now dispute the arrival of the Tofflers' Information Age, few equally understand its foundations and implications.[4] As with other stages of evolution, the Third Wave (information) represents not only mankind's production means, but the source of his conflicts. Wars were fought primarily over territory during the First Wave (agricultural), and production capacity during the Second Wave (industrial). Similarly, the emerging Third Wave will usher in conflicts over access and control of information. If in fact "the 'combat form' in any society follows the 'wealth creation form' of that society as the Tofflers suggest, wars of the future will be predominately, but not solely, 'Information Wars.' "[5] Even conflicts of a "conventional" nature will involve consideration of unprecedented levels of information. While some studies have addressed the benefits and need for intuitive thinking skills, few have breached explaining *why* intuition is paramount. This study hopes to bridge that gap. Making decisions in a computer-aided environment without fully understanding the human mechanics of decisionmaking, will result in only mediocre solutions—a standard unacceptable for those of the profession of arms.

## *Study Limits and Assumptions*

This study will focus on the fundamentals of decisionmaking and the critical role intuition plays in that process. Intended to focus on a layman's perspective, the depth of discussion will be only as detailed as necessary to appropriately explain the concepts covered. While some references will be made to ideas and systems being developed to facilitate military decisionmaking (such as the OODA loop, system of systems, Force XXI), these are not the primary focus of this research.

Likewise, the assumptions of this study reflect commonly accepted psychological principles. The principles chosen purposely exclude any radical new Information Age theories, as a control measure for examining the fundamentals of decisionmaking, remote from the influence of technological advances.

### *Organization of this Study*

The remainder of this study builds toward validating the thesis by enlightening the reader on the basics of analytical and intuitive methods of thought. Once understood, these basics will enhance understanding of how decisions are influenced by a variety of external situations and conditions. Many of the precepts used are tenets stemming from business-related managerial concepts. While not entirely similar, many aspects of business decisions (especially those made in highly competitive and time sensitive situations) can be used to approximate a military commander's situation, albeit greater consequences. The concepts discussed in this analysis are applicable to all levels of command, although the focus will be more applicable to commanders at the operational level of war, such as a MAGTF, corps, or numbered air force commander. Understanding *how* decisions are made is the first step in recognizing that intuition is not a tool of the past.

## *II. THE DECISION PROCESS*

### *Psychology 101: How the Mind Functions*

It has been long recognized that the workings of the human brain represents a dichotomy of intellectual processes. The left hemisphere is responsible for predominately linear, analytical perspectives of thought. Here, information is processed sequentially; crucial because *logical* conclusions are founded on sequence

and order.[6] On the other hand, the brain's right hemisphere functions primarily through means such as spatial orientation (of ideas, situations, etc.), artistic ideas, and pattern recognition. Unlike the sequential pipeline process of the left side, the right side processes information more diffusely, which permits more inputs to be processed simultaneously.[7] Therefore, the left sequentially-oriented hemisphere is typically regarded as logical in nature, while the right diffusely-functioning hemisphere is considered more relational. The products of these two hemispheres are typically categorized as rational and intuitive thoughts, respectively.

## *How the Analytical and Intuitive Differ*

From a psychologist's perspective, the general conclusion of clinical and neurological studies is that the rational (left) mode of thought predominates the intuitive (right). However, it is also recognized that social factors can sway our preferred method of thought as well. Experts such as Joseph Bogen suggest that either process can dominate, depending on the situation.[8]

One of the keys to understanding the analytical, rational mode is that it processes information sequentially. During this sequential processing, the mind focuses on individual segments rather than whole ideas, concepts, or objects. While this proves useful for sorting and assimilating a series of individual facts, the sequential processing also limits how fast it can be done. For example, a commander reviewing a list reflecting the combat readiness status of each of his units must read each individual entry as he sorts through the list. This slows down his overall grasp of his forces readiness until review of the entire list is complete. Additionally, because this process lacks the relational function (like the intuitive process), the

ability to infer which unit is most combat ready is limited. However, because the analytical process forms the foundation of language, mathematics, and rational thinking (sequential, cause and effect), it is thought to be the natural preference of most people.[9] Conversely, these are the same reasons the intuitive is often disregarded.

Due to the perceived spontaneous manner in which intuitive thoughts occur, they are often considered less "rational", and therefore not reliable. Additionally, because intuition is often indescribable (because language is not a product of the right hemisphere), people are often suspicious of intuitive conclusions. However, because the intuitive process is not sequential, it is capable of processing numerous and diverse facts quickly.[10] This is possible because information we are observing is compared with information stored from past experiences, based on subtle similarities of the two. This makes intuition especially well-suited for solving relational problems when rapid integration of visual cues is required (see figure 1). This process seems instantaneous, because information stored in the subconscious is already being recalled while we are orienting ourselves to the situation.

When we experience or witness any event, our perceptions get stored away unconsciously in the memory. Because they are "unconscious aspects", we are not aware of them immediately; they remain below the "threshold of consciousness."[11] When recalled through the intuitive process, they appear as symbolic flashes of insight (hunches or recognition), not rational, cause and effect thoughts which we can easily describe. The truth is, even when we think we recognize and accept something as "rational" or "meaningful" in our conscious mind (a conclusion based on analytical

observation), it is probably because our intuitive process has already judged the analytical observation against an element logged in the unconscious world of intuition. In other words, as twentieth-century psychologist Carl Jung put it, "our conscious representations are sometimes ordered (or arranged in a pattern) before they have become conscious to us."[12]

It now is becoming apparent that the rational and intuitive are in some way connected or interactive. Evidence shows that during normal everyday activities, individuals will alternate between the two modes depending on the situation and type of problem to be solved. While it is not clear how this alternation occurs, it has been proven that even people who habitually prefer one mode over the other will at some point use both modes of inquiry in their decisionmaking.[13] Recognizing that the analytical and intuitive processes are not inextricably linked, allows us to consider how they may be used to complement each other.

## *How the Analytical and Intuitive Interact*

How the rational and intuitive join efforts in the decision process has often been overlooked by psychologists. Many have focused on each process separately, but failed to consider the confluence of the two. For example, although one psychologist hinted at their union when he declared they might in fact "represent a profound complementarity," his work focused on the "deeply different grammar" describing how each functioned.[14] However, more recently researchers have conceded that some type of interaction occurs. Although there is no consensus on how exactly this interchange takes places, most agree the two interact regularly.

Understanding some of the theories of how the analytical and intuitive interact, will reveal the critical role intuition plays in all decisions.

One theory proposed by Cyril Smith in 1978 suggested that the interaction was a two-way flow. Smith argued that while the "atomistic details" processed by the analytical are "insufficient for full understanding, they cannot be ignored."[15] He argued that facts must be considered in the analytical "before imaginative interpretation can be indulged in."[16] This theory is analogous to looking at the individual pieces of a puzzle before attempting to assemble it. His theory alluded to the intuitive's judgmental capability when he concluded that "nothing is a thing by itself: it takes meaning, indeed existence, only as it interacts with something else." Later interpretations of his theory suggested that the imagination was responsible for giving a definable existence to observed details; more important, were theories that suggested that observed details in fact sparked the imagination into action.[17] Thus, Smith concluded that analytical observations interacted with the judgment capabilities and imagination of the intuitive, which in turn would give meaning to the analytical. This process was assumed to be somewhat "automatic." A variation to this two-way flow was the Vickers model of alternation.

Undoubtedly, psychologist G. Vickers came closest to fully understanding how humans use both the analytical and intuitive modes of inquiry to make decisions. The cornerstone of his theory was that humans did indeed use both forms of thought, but not necessarily the appropriate one at the appropriate time. According to Vickers, this is could prove self-defeating because of the stark differences between the two modes. The rational functions of logical reasoning, calculation, and explicit

description, were poor substitutes for the synthesis, pattern recognition, and relational characteristic of intuition.[18] Vickers contended that an alternation takes place in the form of a repeated "creative process" that presents new details for judgment, followed by an "appreciation process," and so on.[19] Unlike the Smith two-way flow model, Vickers claimed the alternation between modes was not automatic, and the inappropriate one might be preferred. The key was recognizing when to rely on which, but that was as far as he developed his thesis. While these theories illuminated that interaction between the rational and intuitive were beneficial, it was the theory of T.R. Blackburn that first proposed some control over which process used was possible.

## *Can Intuition be Trained?*

Blackburn theorized that in order to "see" (understand) the whole perspective of a complex problem, a trained intuition was necessary. He understood the critical importance of the right hemisphere's capacity for recognizing spatial relationships. However, because of the tendency of many individuals to revert to analytical means of thinking, Blackburn was convinced that training was required to exploit one's intuitive skills.[20] By deliberately increasing awareness of our surroundings, he proposed we would increase the amount and quality of experiences "logged" in our subconscious. But this was by no means a substitute for rational deduction; in fact, analytical skills were imperative for observing the experiences to be logged. Additionally, Blackburn argued that one should not discard the analytical during decisionmaking, but should in fact "objectively and repeatedly examine the empirical, before engaging the intuitive."[21] By learning to see whole patterns as well as the

individual parts, looking at all perspectives of a situation being judged, and preventing premature engagement of intuition, Blackburn argued the trained intuition would function at its peak efficiency.

While Blackburn's theory of a trained intuition made great strides in recognizing intuition's critical role in decisionmaking, his views reflect a model in which the analytical does most of the work, except for brief periods of judgment by the intuitive. Most importantly, Blackburn's theory overlooks the single most important benefit of intuition to the military decisionmaker— that it is the ***intuitive*** that permits decisions to made when conditions do not allow sufficient information. While he hinted at the importance of previous experience in intuitive decisionmaking, it would take one more theory to fully develop the key benefit of intuition.

The most important feature of complementary analytical and intuitive interaction is revealed in psychologists R. J. Boland and L. R. Pondy's 1983 concept of "lived experience." This concept suggested that it is *within* the mind, out of previous experience, that new patterns are recognized and given meaning.[22] According to their theory, it is the existence of a previous experience in the intuitive that serves as the vehicle for the analytical and intuitive to combine. It is the encounter of the objective and the subjective (the empirical and the subconscious) that results in comprehension. But unlike other theories, "lived experiences" signaled the keystone role of intuition in decisionmaking. Boland and Pondy's work concluded that "it is *in* the minds … of actors and *out of* their experience that new patterns are formed."[23] Subsequent experts have embraced this concept as a matter of "encounter and performance." This idea proposes that true understanding of a

situation is not achieved until intuition casts its judgment, however a catalyst is required. Essentially, it takes both the detailing of the rational and the patterning of the intuition to give "full expression to a particular interpretation."[24]

All these various theories conclude that some degree and manner of interaction between the rational and intuitive occurs. All agree that both processes are dependent on the other in some manner to function effectively. Likewise, all theories examined have implied an equal contribution by both processes in the course of decisionmaking. However, some conclusions imply that it is the intuition that makes the critical step in the decision process. It is in this step that meaning is given to the meaningless, through the relational capabilities of the mind's right side. This suggests that regardless of how information is exchanged between the rational and intuitive, without an intuitive judgment, a conclusion would not be achieved. If this is true, then fears concerning the erosion of the intuitive skills among computer-dependent military commanders are warranted.

Now with a fundamental understanding of how the mind normally functions, examining the external factors which influence decisionmaking will reveal how an intuitive thinker can be most effective in the Information Age environment.

## *Facets of Modern Decisionmaking*

Just as understanding how decisions are made is crucial, recognizing the influences, complexities, and types of decisions allows commanders to minimize their impact during decisionmaking. This helps decisionmakers avoid typical errors associated with these influences, and allows more energy to be devoted to matters, like focusing their support staffs. From the widest perspective, decisionmaking will

occur within a framework influenced by variables of the world ( *states of nature*), and the will of his opponent (*competitive strategy*).[25] While these may seem blatantly obvious, failure to recognize their impact can result in incorrect conclusions and poor decision time management. Not all pressures are external; some come unknowingly from within the decisionmaker as well.

Sigmond Freud pointed out that there are a number of instincts such as possession, aggressiveness, and dominance which may subconsciously influence which course of action a decisionmaker will select.[26] More obvious, and possibly just as influential, is the decisionmaker's personality and perception habits in given situations. This often determines decisionmaking styles to which subordinates must adapt. Recognizing and accommodating these traits can help the decisionmaker minimize their negative impact during decisionmaking.

One of the most common factors complicating decisions is the natural desire for the optimum solution. During this quest, decisionmakers typically face a large number of alternatives to choose from. Simultaneously, the realization that the best solution is valid for only a snapshot in time (especially in fast-changing situations), requires the decisionmaker to not only interpret current conditions, but forecast them as well. To deal with this quandary, Herman Simon proposed in 1957 that individuals in fact rarely strive for the optimum, but rather define a limited range of outcomes within which it would be acceptable for their solution to fall. Simon coined this propensity the "principle of bounded rationality."[27] Because the amount of information necessary to make a truly optimum decision can rarely be obtained (due to the number of unpredictable *states-of-nature* and *competitive strategies*),

attempting to reach the optimum is unrealistic. For example, a commander who is assessing force strength prior to an engagement would certainly prefer complete information on his enemy. By having such, he could easily compare it with his own force strength to determine if, firepower to firepower, the engagement is desirable. Realistically, he knows such detailed information is impossible, but also knows (because of his own force strength), that if the enemy's capabilities were within a certain range, he would be fairly assured of victory. Despite the processing power available in today's computerized information systems, these principles still hold true for the human brain. Therefore, the envisioned "trap" of analytical decisionmakers becoming fixated on incoming data awaiting the perfect answer, is possible only if the decisionmaker believes the system can provide such an answer; a result of failing to understand the limitations of the human mind and decisions.

How individuals (and organizations) cope with these factors which influence decisionmaking, is by forming "simplified, structured beliefs about the nature of their world."[28] The philosopher Joseph Jastrow believed that the "mind is a belief-seeking rather than a fact-seeking apparatus."[29] During the decision process, an individual's perceptions are "filtered" through sets of these beliefs which Jastrow termed "cognitive maps." These filters serve as a means for the decisionmaker to organize and make sense out of the stimuli he is sensing.[30] While early studies focused on the relationship between the decisionmaker's cognitive process and his environment, the more recent emphasis has been placed on the relationship between the decisionmaker and technology. Although it's widely recognized that decisions may vary according to the circumstances surrounding the process (such as stress), a decision is still the

result of a "number of cognitive activities, regardless of supporting technology."[31] Therefore, regardless of the amount of technological support, decisions are still susceptible to external and internal influences. Less obvious in the decisionmaker's struggle for good decisions, is compensating for the *type* of decision being made.

## *Types of Decisions*

The type of decision being made plays a significant role in how the decision process works, especially for the military commander. This influences not only the decision environment, but also the decision process itself. Basically, decision types vary according to how much uncertainty, risk, information, and competition exists in the decisionmaking arena.

Decisionmaking under *conditions of certainty* reflect situations where we are fully informed of all the factors affecting the decision. This includes the *state-of-nature* which, although normally outside of our control, we have full knowledge of. As can be assumed, these situations are extremely rare due to the amount of knowledge necessary to constitute *certainty.* Likewise, the nature of warfare itself rarely presents conditions conducive to certainty for the military decisionmaker.

Decisionmaking *under risk* represents conditions where there are a number of possible *states of nature*, but the decisionmaker is aware of the probabilities that any one of them will be *the* state to influence the outcome of the decision. Once again, while somewhat more conceivable than decisions under certainty, this luxury is rarely afforded to the military commander. Because many of the factors which influence the *state of nature* include unpredictable human influences, probabilities are difficult to predict. The result is known as decisionmaking *under uncertainty*. Here, as

suggested, the number of *states of nature* may be known, but the probabilities of their occurring is considered unknown. This branches to another decision alternative, that of decisions under *partial information*. Similar to conditions of uncertainty, these decisions are made in the light that some of the probabilities are known, but not all of them. This complicates the decisionmaking process by forcing the decisionmaker to weigh decisions of the known (where he feels more comfortable) against the unknown (which he will naturally incline to avoid). Not surprisingly, these are the most common type of decisions, including for the military commander. If these parameters were not challenging enough, the military commander also routinely faces another type of decision—decisions *under conflict*.

Unlike other decision environments where the decisionmaker faces a variety of uncertainties, decisions *under conflict* assume you face a rationally-thinking opponent. These types of decisions are complicated by the fact that the environment can now change because of the actions and will between two or possibly more opponents.[32] This is especially applicable to military commanders, who often face situations of *complete conflict* of interest with his opponent, meaning one will win at the loss of the other.[33] Initially, these types of decisions may appear impossible to deal with, but there are mechanisms which drive the human decision process when dealing with them. One of these mechanisms is the considered to be a natural "cautious" approach, on which decisionmakers frequently rely.

The Wald Criterion for decisionmaking *under conflict*, developed by mathematical statistician Abraham Wald, takes into account what each opponent is willing to lose when forced to make a *complete conflict* decision. Wald believed that

in the face of uncertainty of others' intended actions, each opponent will attempt to minimize his maximum loss (minimax value) while maximizing his minimum payoff (maximin value) for any possible course of action.[34] While this may seem a logical approach for any decisionmaker, it is important to recognize that this is considered the natural "cautious" approach to uncertainty by most decisionmakers.[35] Pivotal to this theory is the assumption that the opponent is rational, and he too will attempt to reach his own minimax and maximin values. For example, the following table shows a decisionmaker's possible courses of action (COA) compared with estimated strategies of a competitor. Since the conflict is considered complete (zero-sum gain), then the positive values for the decisionmaker (**S**) represent negative values for the competitors (**C**).

| **COA** | $\mathbf{C_1}$ | $\mathbf{C_2}$ | $\mathbf{C_3}$ | $\mathbf{C_4}$ |
|---|---|---|---|---|
| $\mathbf{S_1}$ | 0.6 | -0.3 | 1.5 | -1.1 |
| $\mathbf{S_2}$ | 0.7 | 0.1 | 0.9 | 0.5 |
| $\mathbf{S_3}$ | -0.3 | 0.0 | -0.5 | 0.8 |

Source: Wald Criterion[36]

According to the Wald Criterion, the decisionmaker considers three alternative courses of action or decisions as represented by $\mathbf{S_1}$, $\mathbf{S_2}$, $\mathbf{S_3}$. In conflict decisionmaking, these possible courses of action will be countered by one or more by the opponent (here, represented by $\mathbf{C_{1\text{-}4}}$). For any given combination of actions by the decisionmaker (**S**) and his opponent (**C**), the outcome will be reflected by the corresponding values (say for example, miles advanced during an attack). So, for example, if the decisionmaker decides on action $\mathbf{S_1}$, and his opponent chooses action

**$C_1$**, the decisionmaker's forces (**S**) will gain .6 miles on the advance, while his opponent loses .6 miles. In real life, these values may not be known exactly, but analysis of force strength, possible courses of action, and wargaming may give the decisionmaker estimates of these values. If both opponents have a general estimation of the battlefield (represented by all the values of the matrix), Wald's theory states that they will in fact engage in a systematic manner to minimize their losses, by maximizing their minimum payoff. For example, the decisionmaker realizes that the worst possible outcome of any attempt to counter **$S_1$** would be -1.1; likewise, 0.1 for **$S_2$**, and -.05 for **$S_3$**. Therefore, to maximize his minimum payoff (the worst he could do), he would select **$S_2$**.

Any course of action selected by his opponent will result in at least a 0.1 gain for himself. Likewise, because his opponent is rational, he follows the same methodology and comes up with **$C_2$**. (Remember, the positive values within the matrix represent negative values for the opponents possible courses of action due to zero-sum gain. Therefore, his worst-case values are -0.7 for **$C_1$**, -0.1 for **$C_2$**, -1.5 for **$C_3$**, and -0.8 for **$C_4$**. His best minimum payoff is -0.1 (least loss) under **$C_2$**.) However, if the decisionmaker had information (intelligence) that indicated his opponent would not chose **$C_2$** for some reason (e.g., possibly due to the decisionmakers shaping of the battlefield), then the decisionmaker might be able to assign probabilities to his opponents courses of action, and could then formulate a strategy now under conditions of *under risk* rather than *unknown*.

Obviously this would be more advantageous to the decisionmaker as higher payoffs could be realized. Thus, the value of additional information as a step toward

less uncertainty and higher payoff is immediately tempting. The trap is, however, that the desire for more information becomes addicting. While this natural tendency is not improper under some circumstances, it does have one critical downfall—waiting for more information drastically slows down the decision process. Time is a luxury the military commander can rarely afford.

## *The Impact of Time Constraints on Decisionmaking*

One of the largest deterrents to conducting detailed analysis during decisionmaking is time. Due to the nature of warfare, the military commander faces this constraint more than any other kind of decisionmaker. The reason for this is the theory behind the OODA loop.[37] The OODA loop (see figure 2), represents a decisionmaking model as a continuous, repeated process of observation, orientation, decision, and action (OODA) . According to theorist John Boyd, the military decisionmaker's OODA loop is in competition with his opponent's OODA loop. Whoever completes the cycle faster, will be ahead of the other's decisions and therefore gain an advantage. While some may argue that faster decisionmaking is advantageous only if the decisions are correct, the OODA loop theory espouses that each subsequent step in the cycle will better orient the decisionmaker, because results from the last cycle's action is considered in the next cycle's decision. Regardless of the exact process, the need for expeditious decisionmaking is inherent in military operations; anything that promotes or hinders this must be understood.

One of the primary pressures during decisionmaking, and directly related to time, is possessing insufficient information. Unfortunately, gathering more information occurs at the expense of time—a luxury OODA loop theory does not

allow. The military decisionmaker is therefore faced with two diametrically-opposed problems: insufficient information, and a requirement to accelerate the OODA loop cycle. These two problems then create yet another quandary for the military commander: when has sufficient information been gathered to make the decision and act? This question has been coined the "pistol problem," and addresses an additional pressure unique to competitive decision situations.[38]

This idea likens the decision to a "one shot" chance at an opponent during a duel, as the opponents are approaching each other. Waiting to get closer for a shot is at the risk that the opponent will shoot first and foil your chance for a shot at all. The analogy is how long should you gather information, hoping to improve your knowledge of a situation, all the while risking that your opponent "shoots first" by advancing his OODA loop. Obviously, there will always be situations where delaying your "shot" will occur as some degree of additional information is required to "get close enough to ensure shooting your opponent." The question then becomes, how do you determine when to stop gathering information and act?

## *Postponing Decisions*

The most obvious reason for delaying a decision is to allow more information to be gathered or processed in hopes it will improve the eventual decision. Actually, this is experienced with nearly every decision made by humans, although we may not be consciously aware of the process. The key to knowing when to terminate "processing" and make a decision, is understanding the nature (and quality) of the information available for that particular decision.[39] By knowing how useful the incoming information may be for eliminating uncertainty, the decisionmaker can

decide if it is worth waiting for. A thorough knowledge of intelligence collection capabilities and products is therefore crucial to the military commander. If information is determined worthy of delay, some juncture must be still established for decision because of the "pistol problem" and never-ending pressure of the enemy's OODA loop. A common technique is to establish an "evaluation date," which could be a time or event, beyond which no value would be added, or the risk would be too high, to delay deciding any longer.[40] However, sometimes a decision deadline or termination point may be totally unpredictable, such as the case when an opponent is maneuvering against you. Under these conditions, author of managerial decisionmaking, William T. Morris, suggested that you analyze the information as quickly as it becomes available, with each increment of new information.[41] At each of these stages, compare the cost of stopping and deciding with the possible costs of continuing to gather information; thus, a floating evaluation date results. Unfortunately, because the military decisionmaker must continuously weigh the value of gaining additional information with the cost of delaying, this process must be constantly repeated.

### *Limitations of the Mind: Why We Have Staffs*

The human mind can only focus on a limited amount of information or alternatives at one time, and this limitation become greater as other decision pressures increase. As mentioned, rarely are truly optimum decisions the goal of the decisionmaker, so an acceptable range of possible solutions is established. Likewise, when searching for possible alternatives, increased time pressures will result in increased search rates, which the mind may not be able to handle. As a result, these

functions are often relegated to a decisionmaker's staff, who, when advised of the decisionmakers range of acceptable alternatives (commander's intent), serve to augment his own decisionmaking capacity. While this may appear to solve the commander's limitations, it also holds several traps in decisionmaking. For example, because in a sense "policy is simply the premeditation of decision,"[42] subordinates and staffs will easily accept alternatives which comply with policy (or intent), and may not attempt to pursue an alternative outside of this guidance. As a result, better solutions may be overlooked in the pursuit of acceptable answers. In this respect, while the decisionmaker has described the search pattern boundary for his staff, he may in fact limit their discovery of a better solution.

Minimizing the pressures that time and insufficient information impose on the decisionmaker, can be accomplished by exploiting the non-sequential, relational capabilities of intuition; visualization is one of intuition's most effective attributes for this task.

## *The Role of Visualization*

Visualization is key not only for receiving input for the senses, but also as part of the imagination's functioning during decisionmaking. Often, the problem faced is equated to a "vague, incomplete, doubtful, confused model of the situation," which a decisionmaker is attempting to verify through empirical observations.[43] One of the touchstone skills of effective leaders has been vision, or the ability to think about the future states as though they were in the present.[44] In military leaders, this is synonymous with envisioning an "endstate." By envisioning the future in the mind as an image, the decisionmaker can use this image as a guide for means to achieve that

endstate. But visualization is also key in recognizing an unfamiliar pattern or situation.

Inductive reasoning involves generalization, which essentially works to establish whole pictures from parts, or from particular to general conclusions.[45] This process is crucial to linking the observed inputs of the senses with the assessment of the intuitive. This link, known as precepts, represents a "compound consisting of sensation and memory…which associates a sense experience with a previous similar experience and thus perceives."[46] In this process, the visual observation of parts of an unknown image are used to trigger memory of patterns seen before which are stored in the subconscious. An obvious problem could be erroneous pattern recognition, especially when time constraints result in insufficient information. The seventeen-century French philosopher René Descartes believed that facts derived solely from sensation were not reliable.[47] Subsequent theories modified this axiom to state that senses *could* prove reliable, but *only* in situations where conditions were held constant. Within these conditions, there are no variables for interpretation (*states of nature* are constant, and there is no competing decisionmaker to be gamed against), and relational orientations are immediately manifest. A simple example is demonstrated by a common visual illusion demonstration.

If asked to interpret the symbols in figure 3 to determine which line is the longest, it would be readily apparent. There are no changing conditions, and the judgment is obvious. However, if asked to determine which of the symbols in figure 4 had the longer line, the judgment would not be as easy because of the more complex decision environment. If one had not seen this test before, the chance for

error would be greater because we would lack the previous experience that the lines may actually be the same length. However, if we had been exposed to a similar test before, and had learned that an illusion is possible under these conditions, we may not be as hasty in making a decision without further analytical investigation. Our intuitive would help us grasp the situation as more than the apparent. This same principle applies to assessing an unfamiliar situation.

The transition from the observed to the understood can vary based on the rate of observance, flow of clue information, and environment in which the decision takes place. For example, business management author J. B. Quinn's model of "logical incrementalism" proposed that the process of analyzing the parts of the picture occurs in incremental steps, and that partial solutions are seeds for subsequent thoughts.[48] Others feel that recognition occurs when the new pattern is recognized at once from the emerging image. Depending on the variables being considered, either may be true. Again, the intuitive functions occur so rapidly that it may seem to be a one-step recognition. Descartes termed this phenomena "distinct intuition," which he described as a perceptive flash of insight.[49] In cases such as these, Descartes argued that the decisionmaker relied upon his senses to trigger an immediate assessment (what Descartes referred to as "true meaning") of the situation. Situations like these allowed the decisionmaker to sufficiently understand the problem and make a expeditious decision in order to "induce will to effect it," much like in the OODA loop.[50]

If the *true meaning* was not readily apparent, then Descartes argued that some "study" would be required to gain understanding. During this process of study, the

mind would eventually produce an insight which Descartes coined “clear intuition.” While the rational is analytically processing the cognizant, the subconscious selects from a myriad of items that are stored in the memory that have been gained through real or “vicarious” experience. This process transforms subconscious memory into conscious thought through “sensory perception and [the] act of transforming into conscious knowledge items withdrawn from subconscious storage.”[51] But what if there was no stored memory even remotely related to the sensory perceptions of a situation? Would a decisionmaker then be unable to evaluate and determine the “true meaning” of an entirely new situation? Descartes also addressed this possibility with his theory of “synthetic induction.” In the absence of any stored memory which might be triggered by the visual senses, the mind’s imagination would engage to make “a deliberate effort to visualize intellectually a synthetic substitute.”[52] Thus, when faced with an entirely new situation, where the recognition of an emerging pattern is unlike anything ever experienced, the intuitive process will still produce, via the imagination, a memory in which to compare the sensory perception against. Therefore, the intuitive process of synthetic induction can also expedite pattern recognition, allowing the decision process to be accelerated. Obviously, having the experiences already logged in the subconscious would alleviate the requirement for synthetic induction, which would further reduce pattern recognition and decisionmaking time.

As noted earlier, Blackburn’s “trained” intuition was paramount, and could be enhanced by “logging” experiences from which to feed the intuitive. But the limitations of the mind also serve to remind us that the memory has limits as well.

For example, James S. Weinland, author of *How to Think Straight*, described five typical problems with memory that could negatively impact intuitive capabilities. However, awareness of these problems can allow a decisionmaker to mitigate or circumvent their impact.

First, Weinland believed that during the course of observing experiences unfamiliar to us, the memory we log may not be entirely accurate (as would not be the recall of it), because we were not forced to determine the true meaning during its observation. Thus, these memories will not be as helpful in future situations. Second, we may not train ourselves to use our memories as sources of comprehension, and rely more on the sensory inputs (analytical) which we feel more comfortable observing. Blackburn hinted at this in his theory of a "trained intuition." Third, Wienland argues that some memories logged in our subconscious may not surface because they are suppressed for one reason or another. Here again, although Descartes would argue that synthetic induction could compensate for this situation, it would not be as effective as the recall of an actual experience. Fourth, the memory fails sometimes because of "associational blocking," where a name or figure is confused with another similar experience. Sometimes this results because the cues being used to retrieve the memory, are slightly different that those associated with it when it was logged. Finally, as mentioned earlier, the human mind has a finite ability to store and process information. Weinland argues that our memories may sometimes fail us because we are constantly changing and replacing them through everyday living.[53] These possible memory shortcomings alert us to be aware of how the intuitive process relies on the memory of experiences, and how best to cope with

these problems. As Blackburn believed, we need to train our intuition to provide the fastest possible situation recognition during decisionmaking.

## *III. Implications for Command Decisionmakers*

By understanding the fundamental ways the human mind and environment influence our decisions, we now better understand the tools a decisionmaker has to work with. The fundamentally different hemispheres of the brain perform unique thought processes. The analytical sphere (left) represents the rational, linear-calculating process which strives to apply logic to sensory inputs. The judgment sphere (right) represents the often indescribable, intuitive understandings brought about by recognition of familiar patterns. The two seemingly opposite methods of thought are, in fact, complementary. While the exact manner in which they interact is not completely understood, the realization that both play a role in problem solving is accepted.

### *The Contribution of Intuition*

The primary role of the rational is to process new sensory inputs which will convey factors to be calculated in the decision equation. The analytical mode of the rational makes it well suited for this task. However, except for the simplest of problems, the rational is not suited for determining relational judgments among factors. However, this does not mean this analytical mode of inquiry is not important in the decisionmaking process. Without the unique method of the rational to initiate thought, no decisions could be made. Additionally, because the rational is the home of language skills, it allows us to communicate our eventual decision. The analytical,

rational functions of the brains left hemisphere are truly necessary. However, it is the right hemisphere's intuitive capacity that allows effective decisionmaking to occur.

Intuition is an often misunderstood dimension of decisionmaking. By nature, the non-linear spatial abilities allow thought processes that do not seem "logical", and are therefore interpreted as mystical. The age-old concept of a "gut feeling," often reflects the individuals inability to express the results of intuitive thought. Additionally, because the conclusion was a product of non-linear "logic", the individual has trouble understanding how it came about. Equally mystifying is the perception that the solution or insight just instantly came to mind. It is no wonder that answers reached through a process that does not seem logical, cannot be expressed, and appeared from thin air, would be viewed with some skepticism by rationally-prone human beings. However, it now can be seen that in fact these esoteric functions play a crucial role in the overall problem solving process. In fact, the unique capability of the right hemisphere to orient things spatially is what allows relationships to be understood and judgments to be made. Without this critical capability, very few decisions could be made at all. However, the intuitive is much like a gasoline motor—without something to fuel its ignition, no combustion will occur. The rational analysis of sensory inputs provides the fuel that allows this intuitive engine to run.

At first glance, the theory of complementary interaction between the rational and the intuitive seems an easy way to justify the existence of both. But understanding that this interaction is what sustains the decisionmaking capability of the mind becomes paramount in the study of how best to make decisions.

Recognizing that without one, there is limited recognition that a decision has to be made, and without the other that only the simplest of decisions could be made. The exact method of this interaction is not as critical as accepting that it does occur. For arguments sake, whether the complementary actions of each are alternating, incremental steps of pattern recognition, or simply observation followed by "flashes" of insight and understanding is not critical. What is important is recognizing that an interaction does occur, and to maximize decisionmaking abilities, one should understand the contributions of both sides of this process.

## *Decisionmaking: The Need for Speed*

The significance of understanding the role of intuition is critical to military decisionmakers. The military commander's decisionmaking environment requires the fastest, most comprehensive grasp of alternatives that he can process. The types of decisions he most likely faces are those which are conflict-based, and without sufficient information to alleviate uncertainty. The requirement for expeditious decisions is inherent in the competitive, conflict decisions typical when facing an opponent. The urge to accelerate the OODA loop rate in order to "out decide" your opponent adds exponentially more pressures from time, and to make decisions without sufficient information under these conditions. It is obvious then, that the most effective commander is one that can maximize the speed of his decisions by any means that does not increase pressure on himself. This is often the difference between victory and defeat, especially when facing the "pistol problem" when he who fires first most accurately, wins. But this also reveals another critical aspect of effective decisionmaking—accuracy. It does little good to increase the rate of your

OODA loop if all the decisions you are making in the process are incorrect. Therefore the decisionmaker must not only exploit those aspects of decisionmaking which allows him to decide faster, but more accurately as well. It is here that the power of intuition becomes prominent. A vastly untapped intellectual tool which offers great returns, the intuitive powers of decisionmaking are well-suited for the demanding decisionmaking faced by military commanders. Only because it is misunderstood and overshadowed by the apparently more logical, rational mode of inquiry does the intuitive go unexploited. Now, faced with an era where the linear-based computing power of the microprocessor misleadingly offers the power of thoroughly and rapidly "painting the picture," many consider intuitive skills no longer necessary. The truth is, the opposite is the case. The new decision systems being organized may on the surface appear to be super-analytical, but in reality will not improve decisionmaking if intuition is neglected. Several new command theories illustrate this point.

## *Intuition's Role in the Theory of Command*

A major shift in the ideology of command principles is occurring simultaneously with changes in warfighting. In Martin Van Creveld's *Command in War,* he describes several different methods of command and how various military services embrace them in their new warfighting initiatives.[54] For example, he equates the concept of *command by direction* with the Army's digitized battlefield warfighting methods (proposed in their Force XXI). By allowing all that occurs on the battlefield to be known by all at various levels of command, the military commander will be able to direct the battle effectively at all levels. Thus, reaction to

thorough, immediately available information is all that will be necessary to successfully execute the battle. A related concept, also highly dependent on information, is command by plan.

Van Creveld argues that *command by plan* is the current strategy espoused by the joint warfighting commanders. In this concept, extensive knowledge of the enemy's constitution is available through various sensors and collectors, or what has been coined a "system of systems." A variation of the command by direction concept, here information will be so complete as to allow a detailed plan to be successfully executed. This approach relies not on necessarily knowing what's going on at any given time, as much as knowing sufficiently enough beforehand to allow an intricate plan to be developed. By following the well thought out plan against the enemy (whose disposition is intimately known), execution will be successful. Similar to command by direction however, *command by plan* is directive through the plan, not necessarily the impromptu direction of the commanders during execution. The final type of command relies less on explicit direction, and also supports the Marine Corps warfighting methodology.

While appearing less controlling, *command by influence* is merely an attempt to disseminate the direction from higher echelons of command to those closer to the situation. These concepts are imbued in the *maneuver warfare* doctrine, which empowers lower echelons of command through mission-type orders to embark upon the task of completing the mission as they deem appropriate. Key to this concept, is the assumption that the commander closest to the situation will have the best information on how the task should be completed. While maybe not apparent, there

is a common thread among these three concepts of command—information for decisionmaking.

While the three distinct concepts of command appear significantly different, they actually attempt to address the same problem. Regardless of the period of history or type of warfare being conducted, the military commander has always faced the problems of uncertainty and insufficient information.[55] By attempting to shift the source of information gathering from collection systems (command by plan), digitized sensor systems (command by direction), or human element closest to the event (command by influence), all three of these approaches hope to overcome the information deficit, and therefore reduce the uncertainty. In essence, all three are attempts to increase the decisionmaker's effectiveness. For example, advocates of the Army's Force XXI claim that "modernized information operations improve the commander's ability to synchronize operations in his battlespace… [the] commander's situational awareness and the staff's shared picture of the battle [have] allowed the commander to make more accurate and rapid decisions than non-digitized counterparts."[56] But not all agree with this assessment. In fact, Martin Van Creveld felt that while the digitized battlefield might increase the amount of information available to the decisionmaker, this could in fact be "inadequate and … self-defeating." This position implies that while there may be benefits to funneling more information to the warfighters, this alone cannot solve all problems. The fundamentals and arguments on decisionmaking discussed earlier would seem to support this viewpoint. Regardless of the capabilities of decision-support equipment

employed by decisionmakers, the decision is finally made by a process within the human mind, and is therefore subject to its capabilities and limitations.

## ***IV. Conclusions***

As the presence of computers pervades even the most routine facets of daily decisionmaking, fears that intuitive skills may erode are warranted. This is not due to superior performance offered by computer-aided decision systems, but rather the misconception that computers can substitute for human judgment. Affinity for analytical systems in an increasingly digital world is caused primarily by the ignorance of the human decision process. In reality, enhancing and relying on human intuitive abilities allows even greater exploitation of the information from the digital battlefield. However, until effort is made to understand, train, and rely on intuition as a valid decision method, the natural human tendency to gravitate towards rational, analytical methods will prevail.

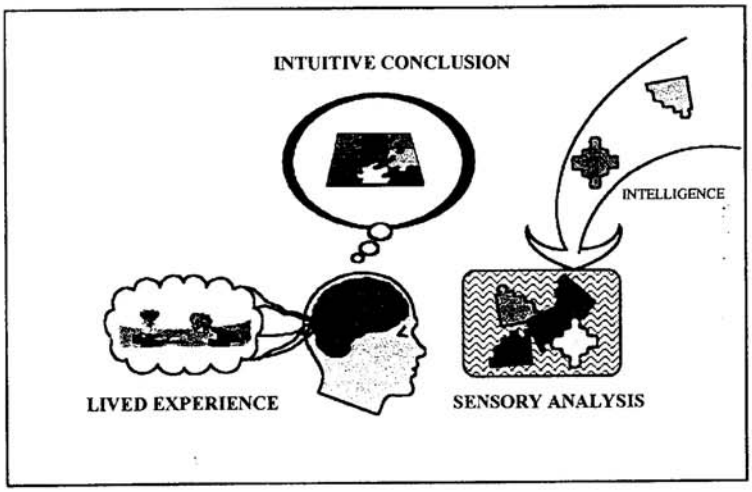
Only by understanding the distinct, yet complementary interaction of the rational and intuitive will improved decisionmaking be possible. While analytical processing is crucial, the unique benefits of the intuitive allows for expeditious, accurate decisions. Also, understanding how internal and external variables influence our thought process permits commanders to recognize and alleviate typical decision pressures. Finally, with a grasp of decision mechanics, the commander is better prepared to exercise a variety of command styles, all founded on a common decision dilemma—lack of sufficient information.

Throughout history, many great military leaders have been associated with a unique insight of the battlefield situation. Their historical decisions are often

attributed to this esoteric talent, which some have even considered mystical. Closer inspection of these successful commanders would have revealed a common trait—experience. Acquiring a substantial experience base, through actual or vicarious means, is the key to accelerating the recognition, relational significance, and ultimate comprehension of unknown situations. Associating the analytical (observed through senses) with memories recalled from the subconscious, the intuitive's spatial orientation allows clues to judge the similarities and come to a conclusion (see figure 6). Obviously, the greater the "data bank" of previous experiences, the faster and more likely the intuitive can provide the answer. However, inexperience does not equate to inability to make decisions. While, as Descartes suggested, the imaginative abilities will allow the intuitive to produce a "synthetic experience" as a yardstick, more rational analysis may be required to arrive reach a conclusion. This notion is represented in figure 7, which reflects the mix of the analytical and intuitive needed to make a decision as the decisionmaker matures in experience. One might erroneously conclude that the intuitive is not required if the analytical is completely supplied efficiently by an information system. But while information systems may indeed aid in providing data for analyzing, it is still the intuitive that associates the observed with a recall, judges the relationship, and reaches a conclusion. The lesson here, is that a trained intuition will allow relatively faster decisionmaking regardless of the stage of experience, or aid of information systems. Regardless how fast or completely an information system fills up the "A" portion of a decision (see figure 5), the "I" must still make the call as to what the emerging puzzle means.

The long-misunderstood elements of intuitive thought is responsible for the skepticism surrounding it as a legitimate source of answers. By understanding the mechanics of decisions, it becomes apparent that not only is intuition an important factor, but its role is absolutely critical. In an emerging era where analytical tools promise to calculate our decisions for us, our natural inclination is to consider "hunches" archaic and primitive. But despite how computers might help us see the battlefield, the key to fully and rapidly understanding the situations that face us, still comes from within. With proper education and training, we might come to recognize those mysterious, intuitive flashes of insight as the key to our decisions.

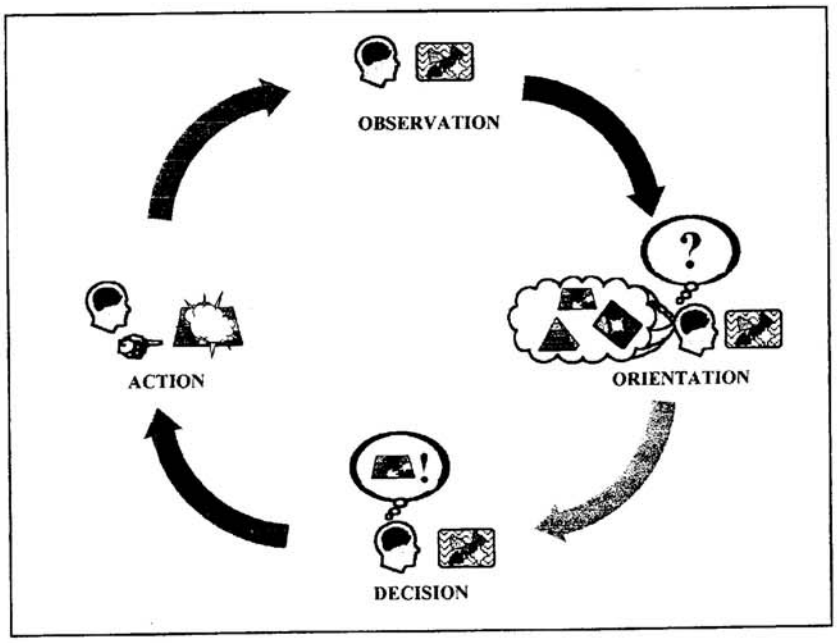
## The Analytical/Intuitive Thought Process




**(figure 1)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

## OODA Loop Decision Cycle

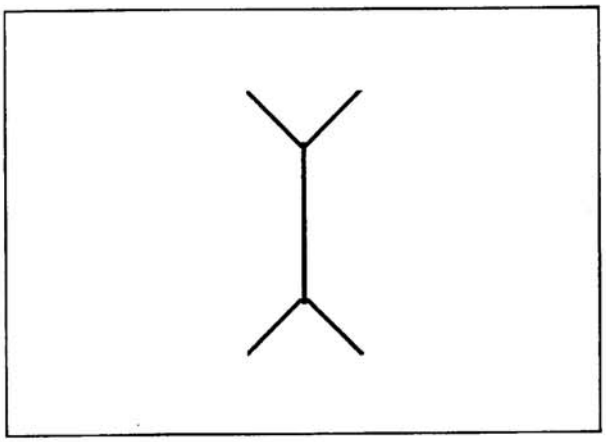



**(figure 2)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

A1

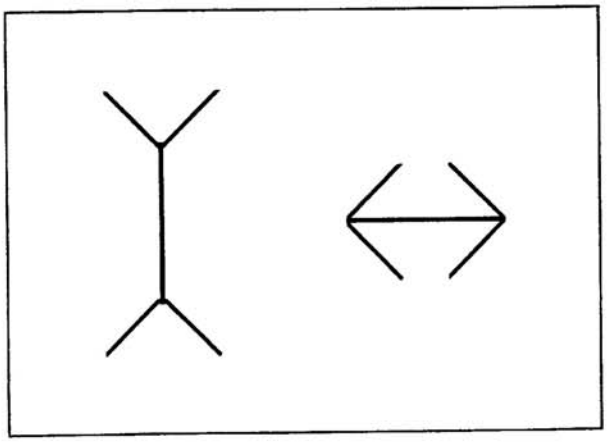
**Simple Environment Perceptions**



**(figure 3)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

**Complex Environment Perceptions**

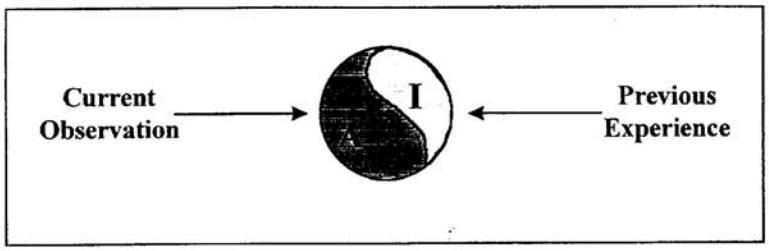


**(figure 4)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

A2

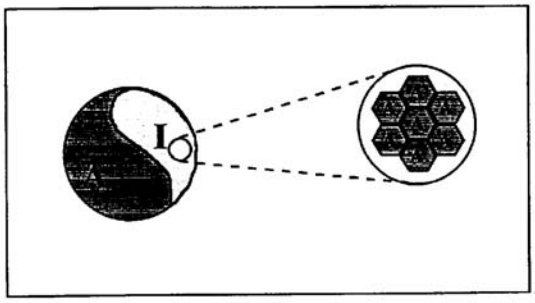
**Situational Awareness**




**(figure 5)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

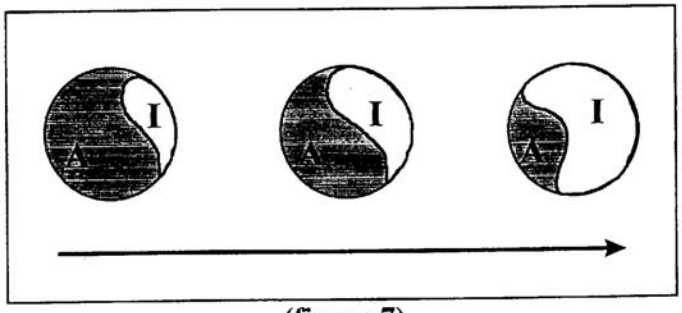
**Composition of Intuition:**
**"Lived Experience"**




**(figure 6)**

Source: Drawing by author, incorporating concepts noted and referenced in the text.

**Decision Mix as Experience Increases**




**(figure 7)**

Source: Drawing by author.

A3

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## NOTES

[1] Paul T. Harig, "The Digital General: Reflections on Leadership in the Post-Information Age" in Parameters: US Army War College Quarterly, Vol. XXVI, No. 3 (Autumn 1996), p. 133. The thesis of this article follows that, despite the advances in information availability and management brought about by the Information Age, all great commanders (decisionmakers) are empowered by their intuition. Although each may adapt to the changes in technology afforded by his era of history, the fundamental principles of effective decisionmaking are timeless.

[2] Ibid., p. 133.

[3] Ibid. p. 134. This is critical because a "cultivated sense of intuition" is considered by the author to be one of the few basic traits of a successful commander, and one of the salient human dimensions of command.

[4] Thomas J. Czerwinski, "The Third Wave: What the Tofflers Never Told You" from National Defense University's Strategic Forum 72, April 1996, http://198.80.36.91/ndu/inss/strforum/forum72.html, p. 3. The author bases his point on George Stein's (USAF Air University) summarization of Toffler's *War and Anti-War* thesis of the same concept.

[5] Ibid.

[6] Robert E. Ornstein, The Psychology of Consciousness, (New York: Harcourt Brace Jovanovich, 1972), p. 20. This is the typical characteristic of a right-handed individual. For the approximately five percent of individuals who are left-handed, some have mixed or reverse specialization of the brain's hemispheres.

[7] Ibid., p. 21.

[8] Ibid., p. 22. For additional reading on these concepts, see Joseph E. Bogen, "The Other Side of the Brain" in Bulletin of the Los Angeles Neurological Societies, vol. 34, no. 3 (July 1969).

[9] Ibid., p. 34.

[10] Ibid., p. 31.

[11] Carl G. Jung, Man and his Symbols, (Garden City, NY: Doubleday & Company Inc., 1964), p. 23. Throughout this research work, the term "unconscious" is sometimes used in the present-day psychological understanding of the "sub-conscious." Both imply the concept of thoughts "not in the conscious", yet are both used to maintain accuracy of quoted and referenced material.

[12] Ibid., p. 38.

[13] Ornstein, pp. 33-35. Part of the preference for one mode of inquiry over the other can be found in the occupation, and even the culture of the individual. Some occupations, such as science and law are more linear in nature and therefore require heavy reliance on the analytical processes. The tendency to utilize one mode more than the other may create a behavioral preference in some individuals, despite the situation.

[14] Suresh Srivastva, The Executive Mind, (San Francisco, CA: Jossey-Bass Inc., 1984), p. 172. The researcher, Jerome Bruner, summarized in 1962 that the two modes of inquiry operated under distinctly different rules ("deeply different grammar"), yet breached the idea that they may in fact work in a complementary fashion. Many early researchers hinted at this possibility, yet failed to concretely establish that conclusion.

[15] Suresh Srivastva, The Executive Mind, (San Francisco, CA: Jossey-Bass Inc., 1984), p. 173.

[16] Ibid., p. 173

[17] Ibid.

[18] Ibid., p. 175

[19] Ibid., p. 176. The author contends that the description of these two processes were Vickers' greatest contribution to understanding the union of rationality and intuition. However, for the purposes and focus of this research paper, the recognition that both intuition and analytical means of comprehension are not only compatible but interactive is viewed as the most significant contribution of Vickers' work.

[20] Ibid., p. 172. Blackburn's conclusions were directed toward the scientific community, but represent the diverse requirements a military commander's decisionmaking process as well.

[21] Ibid., p. 172.

[22] Ibid., p. 174.

[23] Ibid., p. 174. "Actors" to be interpreted as decisionmakers in the context of this research paper.

[24] Srivastva, p. 178.

[25] Ibid., p. 27. The terminology in parentheses represent the referenced author's terms.

[26] Alix Strachey, The Unconscious Motives of War, (New York: International Universities Press, Inc., 1957), p. 20. While Freud lists these as "limited instincts," translation differences (German-English) may more accurately describe them as "drives." Despite the semantics, the issue is that the various drives of one person may influence his decisionmaking in a particular manner.

[27] David W. Miller and Martin K. Starr, The Structure of Human Decisions, ( Englewood Cliffs, NJ: Prentice-Hall, Inc., 1967), p. 50.

[28] Robert Axelrod, ed., Structures of Decisions, (Princeton, NJ: Princeton University Press, 1976), p. 19.

[29] Ibid., p. 20.

[30] Ibid., p. 20. The author further points out the difference between "beliefs" and ideology or policy preferences. In this context, beliefs is meant to describe an "integrated set of beliefs about the decisionmakers environment." The cognitive process described reflects the interaction between the individual's belief system and his environment.

[31] Ibid., p. 39.

[32] Miller and Starr, p. 108. An expanded discussion of the decisionmaking concepts of: conditions of certainty, certainty, under risk, under uncertainty, partial information, and decisions under conflict, can be found in chapter five.

[33] Ibid., p. 128.

[34] Miller and Starr, p. 129. This type of decisionmaking is also known as game theory. Crucial to the related assumptions is the premise that both opposing players act in a "rational" manner.

[35] Ibid., p. 125.

[36] Ibid., p. 129.

[37] The OODA loop represents the mental process also known as the "decision cycle," "OODA loop," or "Boyd Cycle," after Col. John Boyd, USAF (ret) pioneered this concept in his lecture "The Patterns of Conflict." Boyd identified a four-step mental process which described the brain's activities while making a decision: Observation, Orientation, Decision, and Action. Boyd's theory concludes that each participant of a conflict (as in warring opponents) first observes the situation, then orients himself (estimates how does this affect me and how can I affect the situation), before making a decision on what action to execute. Because each cycle influences the situation, a new situation requires the process to be repeated. Boyd argued that the participant that completes the cycle faster gains an advantage with each successive cycle, until the slower is finally overcome by events. This concept is frequently associated with the principle of war known as tempo. (From Naval Doctrine Publication (NDP) - 1)

[38] William T. Morris, The Analysis of Management Decisions, (Homewood, IL: Richard D. Irwin, Inc., 1964), p. 473.

[39] Ibid., p. 475.

[40] Robert Schlaifer, Analysis of Decisions Under Uncertainty, (New York: McGraw-Hill, 1969), p. 65. This technique is also known as "delimiting" a decision problem. This process includes not only establishing a time limit on when to stop processing information pertaining to a decision, but also the scope of information that will be considered up to that time limit.

[41] Morris, p. 483.

[42] Ibid., p. 506.

[43] Ibid., p. 5. This visual analogy represents the foundation on which the importance of the intuitive is based. In attempting to clarify and understand the hazy picture of the situation, the decisionmaker inputs data (akin to adding pixels to an image) until a pattern is recognized. Not only are strong intuitive skills necessary for this process, they are imperative.

[44] Suresh Srivastva, The Executive Mind, (San Francisco, CA: Jossey-Bass Inc., 1984), p. 2. This process is crucial to visualizing the desired "endstate" of a decision, and will directly impact the manner in which it is arrived at.

[45] Raymond S. Nickerson, Reflections on Reasoning, (Hillsdale, NJ: Lawrence Erlbaum Associates, 1986), p. 70.

[46] James D. Weinland, How to Think Straight, (Totowa, Littlefield, Adams & Co., 1966), p. 5.

[47] Ibid., p. 6. Descartes based his conclusions on examples dealing with science. For example, senses may not fully recognize a hard substance, a soft substance, and a liquid all representing the same substance under varying conditions (wax). Similarly, the same event (such as walking a mile) may appear significantly different if done under varying conditions. Thus, the general conclusion is that the senses can provide constant, and correct, interpretations of stimuli if the conditions are held constant. In the absence of constant conditions, judgment must be relied on to account for changing conditions.

[48] Suresh Srivastva, The Executive Mind, (San Francisco, CA: Jossey-Bass Inc., 1984), p. 187. The thrust of Quinn's model of "logical incrementalism" pertains to strategic decisionmaking. The theory suggests that identifying unknown situations through several incremental steps (testing the validity of conclusions to date and providing direction for subsequent inquiry), and by identifying pieces rather than the whole of an emerging image which can then be related.

[49] Charles M. Bowling, Principles and Elements: Thought Construction, (Houston, TX: CSY Publishing, Inc., 1987), p. 16.

[50] Ibid., p. 17.

[51] Ibid., p. 42.

[52] Ibid., p. 43.

[53] James D. Weinland, How to Think Straight, (Totowa, NJ: Littlefield, Adams & Co., 1966), p. 6.

[54] Thomas J. Czerwinski, "Command and Control at the Crossroads" in Parameters: US Army War College Quarterly, vol. XXVI, no. 3 (Autumn 1996), p. 122. The original article relates these various methods of command to the concepts associated with Toffler's Third Wave. The intent here is to show how decisionmaking is an integral part of all these approaches' attempt to overcome insufficient information.

[55] Ibid., p. 122.

[56] Ibid., p. 123.